DigitalGlobe Wideband Downlink Systems

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QuickBird 2 WB Downlink at X-Band

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- QB2 is in 450 km orbit, inclined 97.2 deg, sun-synchronous
- QB2 WB downlink at 8185 MHz
  - 320 Mbps OQPSK – uses most of 8025-8400 MHz band
  - In use every day over 7.3m remote ground terminals at Fairbanks, AK, and Tromso, Norway
  - Operates with nearly zero BER uncorrected
- DSN interference not an issue with present RGTs
  - Procedure in place to avoid interference in event of downlink to vicinity of a DSN site
- Third RGT in South Carolina under construction
  - Jackson and Tull, 4.27m

RGT Characteristics for Good WB Performance

- Gain flatness, VSWR, cable equalization, phase noise important design considerations for good WB downlink performance
- Periodic preventive maintenance visits important to check cables, alignments, environmental effects on hardware
  - Both sites are in Arctic locations
  - RF sweeps performed periodically looking for interferers
    - Several carriers have been found at RGTNW
  - Noise floors near horizon measured vs. elevation
    - Enhances obscura measurements, low elevation operation planning
  - RF levels, gains, conversion frequencies checked

Terra Direct Downlink Potential Interference With QB2

- If Terra is within 1 degree of RGT antenna boresight (main + 1st sidelobes), QB2 downlink will be compromised
  - Analysis based on DG RF measurements of Terra passes
  - Terra is at ~705 km, incl. = 98.2 deg -> slightly different inclination than QB2
  - QB walks under Terra approx. every 28 hours
  - Probability of interference is under assessment, but expected to be low
    - Near-misses happen often – pointing geometry helps prevent interference events
- QB2 has not experienced any interference to date at either RGTNW or RGTAK

Future DG Spectrum Use Considered

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- Future missions are examining Ka-band (25.5-27.0 GHz) for higher data rates
  - 1 to 3 Gbps requirements are possible
  - Single polarization per channel preferred for higher order modulations, multiple carriers
    - Antenna axial ratios strong player in cross-pol interference
  - Dual-polarization frequency re-use for OQPSK acceptable
- X-band will continue to be considered for lower data rate missions (< 800 Mbps)